

1464 Pilot Station RPSU Power Plant Relocation Project
Final Closeout Summary Report September, 2018
Submitted by Alaska Village Electric Cooperative, Inc.

This Closeout Summary Report is filed with the federal grantor agency the Denali Commission (“Denali” or “DC”) by its grantee partner Alaska Village Electric Cooperative, Inc. (“AVEC”). The federal grant award covered by this report and this project is 01464-00 (“1464”), as subsequently amended. AVEC was the grantee of the DC funding for this project, managed the project, and is the sole project participant. As owner and operator of the relocated power plant, AVEC is also responsible for future maintenance of it.

This project is being closed because the project is complete and is in full operation, and the funding has expired. This report represents the project status as of September 30, 2018. As of that date, total project funding exceeded total project outlays by \$2,432; of this amount, \$1,946 is federal funds and is available for deobligation; this is in addition to one earlier, mid-project deobligation by award amendment. This award does not cover indirect costs.

Background – AVEC is a member-owned, non-profit rural electric cooperative serving 58 rural Alaskan communities, all of which (with one exception) are located well off the state’s road system and accessible year-round only by aircraft, and accessible by ship only seasonally. None of AVEC’s member communities is connected to the state’s power grid. Consumers in these rural Alaska communities pay some of the highest electric power rates and fuel prices in the U.S.

This grant benefits the remote rural community of Pilot Station, Alaska (population 625). Pilot Station is a remote rural Alaskan community, a Yup’ik Eskimo village with a commercial fishing and subsistence lifestyle, located on northwest bank of the Yukon River, surrounded by the Yukon Delta National Wildlife Refuge, 12 miles east of St. Mary’s and 87 miles north of Bethel (the nearest community with extensive state government services). It lies at approximately 61.938 North latitude and -162.88 West longitude (Sec. 5, T021N, R074W, Seward Meridian). The area has a maritime climate; water equivalent precipitation averages 16 inches annually, including an average 60 inches of snowfall; summer temperatures average 41 to 57 degrees F, winter temperatures average 6 to 24 degrees F, and extremes have been measured from 83 to -44 degrees F. Pilot Station is easily accessible by river-going vessels for delivery of major freight, however the Lower Yukon River in this area is ice-free only from mid-June through October. The State of Alaska maintains a gravel airstrip accessible year round for passenger travel and delivery of mail and freight. The community incorporated in 1969 under state law as a second class city. In July, 2017, the retail prices of gasoline and diesel/heating fuel were \$6.03 and \$7.32, respectively.

Activities - The scope for this project involved moving the Pilot Station power plant, owned and operated by AVEC, to a new site collocated with AVEC’s new diesel fuel tank farm, on Airport Road just south of the community’s sewage lagoon and just north of the community’s school in the north-central portion of town; this newly-developed site was chosen for its location in an industrial sector of the community away from residential neighborhoods and community gathering places. The plant was relocated to move it away from river level where it was regularly subject to damaging spring flood events, to a site on higher ground. The scope also included upgrading the distribution system as necessary to tie-in to the relocated plant.

The plant consists of a 1970’s vintage “Butler building”; many of AVEC’s oldest power plants are similarly constructed and outfitted. The power plant includes three diesel generator sets, including a 397 kW

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Cummins unit, a 350 kW Cummins unit, and one 195 kW John Deere unit. According to AVEC records, the power plant generates an average of 13.30 kWh per gallon of diesel.

The site for AVEC's relocated power plant and new tank farm was provided by the Pilot Station, Inc. (the ANCSA village corporation for the community of Pilot Station) and by the City of Pilot Station.

As of the date of this report, all activities included in the scope of award 1464 are complete, and the facilities are operating satisfactorily.

AVEC has long maintained prioritized rankings of its RPSU and BFU facilities, with the goal of first upgrading those with the highest environmental risk exposure; and/or those presenting the greatest opportunity for increases in fuel efficiency (defined as kilowatt-hours produced per gallon of fuel), such as through consolidation and interconnection of communities, or through replacement of older, less efficient generators and control systems, or through incorporation of renewable energy sources, etc. Due to the high environmental risk exposure of their original location within the flood zone of the Yukon River, the AVEC power plant in Pilot Station was relocated under Denali award 1464 and the bulk fuel tank farm that supplies diesel fuel to the power plant was entirely decommissioned and replaced with new facilities under award 1465; these two awards were funded, and the two projects executed, concurrently.

This project and the facilities completed under award DC 1464 were developed and built as part of an amalgamated, long term strategic program of energy projects for Pilot Station and the nearby communities of St. Mary's and Mountain Village (situated 12 and 38 miles west of Pilot Station, respectively). Under an earlier DC-funded project 54A, AVEC engaged consulting engineering firm NANA Pacific to broadly evaluate sub-regional energy infrastructure solutions for St. Mary's, Mountain Village and Pilot Station, and also to include Marshall, another community in the area. NANA Pacific published its data, findings and recommendations in a Pre-Conceptual Design report (Pre-CDR) on March 26, 2007. The Pre-CDR recommended further consideration of a sub-regional power system involving a prime power plant in one community, and interties to one or more of the other communities, and retiring power plant(s) and replacing them with standby backup power module(s) in each of the intertied communities. Further studies conducted in 2007-10 funded by DC award 356-07 (Project 73A) Intertie Studies and Transmission Development, and in 2007-10 under DC award 1347 St. Mary's Interties Design and Permitting, examined the feasibility of interconnecting and powering all three communities from a single prime power plant. These studies concluded that connecting Mountain Village and St. Mary's into one electric power grid was indeed feasible; however, challenging terrain and surface water conditions on any proposed intertie route between Pilot Station and St. Mary's made that particular connection inadvisable. This led AVEC to decide Pilot Station should continue to host its own power plant. Meanwhile, historic seasonal flooding in and near the Pilot Station power plant grounds made it imperative the plant be moved to higher ground.

In 2012, funded by DC preconstruction award 1398, AVEC engaged consulting engineers CRW Engineering Group, LLC (CRW) to evaluate electric power and bulk fuel storage facilities in Pilot Station. CRW gathered power and fuel supply and demand facts and data from AVEC and other participants, from private enterprises serving the community, from earlier published studies and energy planning documents, and from public databases. CRW personnel made site visits to Pilot Station in March 2013 and June 2013.

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CRW and AVEC personnel presented the draft CDR in Pilot Station to the other participants and the community at large on August 26, 2014, at which time the City and the Corporation consented to the project as presented, executed documents granting all necessary site control, and executed a Memorandum of Agreement outlining the participants' roles in and responsibilities to the project moving forward.

In its CDR, CRW identified, described and evaluated the AVEC power plant and distribution system; the seven existing tank farms and one planned tank farm, as well as existing barge headers, fill pipelines, and dispensing facilities; population trends; historic and projected future electric power supply and demand and fuel consumption required to satisfy the power demand; historic and projected future transportation, space heating and other non-electric energy demand and fuel consumption required to satisfy that demand; potential local renewable energy options; general geotechnical conditions and flood considerations; permitting including relevant regulations and codes governing environmental law, spill response, fire, electrical, etc.; local resources and materials relevant to heavy construction activities; site control considerations; and other pertinent facts, trends, requirements and resources. CRW then outlined three comprehensive design alternatives and ranked them. The top-ranked, preferred alternative was Alternative #3, which for AVEC called for relocation of the existing power plant to higher ground away from its historic location in the flood-prone area very near the river bank, plus construction of a new tank farm to supply it. Lower-ranked alternatives centered around replacement of the existing AVEC power plant by a new power plant, and as discussed above, connection by a new intertie to a prime power plant in nearby St. Mary's.

As noted, the CRW CDR also reevaluated in its Alternative #2 the concept of connecting the Pilot Station power grid to St. Mary's by means of an intertie. This intertie alternative would need to cross terrain considered very difficult to access for maintenance or emergency repairs in summer, and necessitated significant BFU and RPSU in St. Mary's, where the prime power plant for the two (or three) communities would then have been located. The CDR concluded the required St. Mary's upgrades would likely take too many years to achieve, leaving the existing Pilot Station power plant and its tank farm vulnerable in the meantime to flooding in its present location. Further, the total cost of Alternative #2 including the intertie was estimated to be substantially higher than relocation of the existing Pilot Station power plant under Alternative #3. Finally, the existing power plant was judged to be both relocatable and suitable for reuse, and able to provide continued reliable electric power into the foreseeable future; these conclusions in turn led to a lower ranking for Alternative #1, which featured replacement of the existing power plant with a new facility at much higher cost.

Once the CDR was complete and accepted, preconstruction award 1398 also then funded the ready-for-construction design of the power plant relocation accomplished under award 1464, as well as all bulk fuel storage facilities constructed under award 1465. To facilitate these designs, this scope included a geotechnical study and report completed by Golder Associates in subcontract to CRW; and topographic survey, environmental assessment and permitting, site control, survey and platting, and fire marshal plan approval, all completed by CRW.

This project was executed following a competitively-bid, fixed-price contracting model according to specifications and contract documents published by CRW and reviewed by AVEC. AVEC developed a strategic plan to complete two major community infrastructure projects in Pilot Station (construct three tank

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farms and power plant relocation) concurrently in order to encourage bidding construction contractors to plan for optimal utilization of construction resources, especially heavy construction equipment (certain pieces are relatively expensive and would have to be barged in), fill material, and skilled labor, to result in lower construction costs overall. The contract was advertised for bid in January 2016; two responsive bids were received and the contract was awarded in March 2016. STG, Inc. (STG) was the low bidder for the overall bid and each of the three sub-portions of it: AVEC tank farm (DC award 1465), Corporation and City tank farms (also DC award 1465), and relocation of the AVEC power plant (subject Denali award 1464). The entire combined construction contract with STG was initially valued at \$6,631,150 and ultimately totaled \$6,836,666 with change orders; the portion of this contract allocable to the power plant relocation project was \$511,950.

The overall schedule for the power plant relocation was largely built around the schedule for the new tank farms construction project, the latter being much more complex and extensive than the former; field work schedule called for construction of the tank farms first, followed by relocation of the power plant. In winter 2015 – 16, AVEC procured a refurbished genset for the project, later used to temporarily power the community while the primary power plant was offline while being moved, reassembled and reconnected. STG's procurement, mobilization and construction activities commenced in late winter - spring 2016. By June 2016 all materials and all heavy construction equipment necessary for relocation of the power plant were on site, including the temporary power genset which was shipped from the Port of Bellingham to Pilot Station via the same barge that carried the new bulk tanks for the new tank farms. STG built the gravel pad for the power plant in summer 2016, when it built the pad for the adjacent new AVEC tank farm; the project was able to procure all gravel and other fill material locally and avoid importing fill.

The lower, on-grade portion of the power plant's old foundation was disposed of and replaced by a new set of beams and weight-distributing pads, all made of treated timbers and built on grade at the new site; from that point upwards, the plant was severed from its old foundation beams. The length of the new foundation was also extended horizontally (approximately doubled in comparison to the old site's foundation) to accommodate a new elevated storage section consisting of steel shipping containers. This new timber foundation places both sections of the plant several feet above grade.

Equipment removed and salvaged from the plant prior to the move (and reused after the move) included all exterior piping, valves and fittings, after coolers, radiators, exhaust stacks, equipment supports and covers; STG also drained and disconnected all fuel supply piping and glycol lines at their exterior fittings. (The glycol is heated by a heat recovery system installed on the gensets' diesel engines; the glycol lines then deliver the recovered heat to the emergency living quarters (ELQ), a converted shipping container, to supply the ELQ's space heating needs.) All old exterior decking and ramps were disposed of, along with the old on-grade portion of the plant's foundation.

STG moved the Butler building including all its installed gensets and other interior components October 1, 2016, employing a crane to lift it by its girders onto and off from a tractor-flatbed trailer combination. It was placed onto the new post and beam foundation, and STG reinstalled all salvaged exterior equipment listed above, and placed eight new 100kVA transformers onto Nordic concrete pads outside the plant. A new, separate floor section was built adjacent to the power plant at the same height as the plant's floor, onto

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the extended on-grade timber foundation system described above; then 4 twenty-foot steel freight containers (two existing and two new) were placed atop this new separate floor, and a new, sloped, corrugated steel roof constructed atop the shipping containers. One of the existing containers is the ELQ; STG placed it immediately adjacent to the power plant and reconnected the glycol lines originating in the plant to supply heat to the ELQ. In order, the next container in line is a heated storage unit and the remaining two provide unheated storage. A fifth shipping container, an existing unit from the old site containing the plant's spill response equipment and supplies, was moved into the new yard and placed on a simple treated-timber foundation.

New exterior steel decking and steel under-structure to support it were constructed and attached to a smaller, separate on-grade treated-timber foundation, and at floor level to exterior walls of the power plant and the storage section; new steel stairs and steel ramp were attached to the new deck to provide access from ground level; the new deck spans the entire width of both the plant and the shipping container (ELQ and storage) section, connecting the two sections at floor height several feet above grade. Perimeter security fencing and lighting was installed around the entire new site.

In October, 2016, field crews from AVEC's Operations Department completed the distribution tie-in between the plant and the local power grid, including connections to the transformers and the plant's switchgear; they installed/extended new glycol supply lines to the shipping container designated for heated storage; and tested all gensets, electrical connections, and accessory equipment. The AVEC field crews successfully energized the power plant in its new location October 22, 2016.

During relocation, AVEC determined the old roof of the power plant building was failing and unrepairable; STG returned in summer 2017, to cover the failing roof with a new, sloped, corrugated steel roof. Upon completion of this change order, AVEC issued a letter of substantial completion to STG. Also that summer, AVEC completed cleanup of its old site, and continued fine tuning the power plant in its new location.

In addition to primary project engineering provided by CRW, AVEC's Engineering Department designed and/or specified the distribution upgrades necessary to connect the plant at its new site to the existing power grid, including aspects of the transformers and switching equipment.

Funding and Costs - Funding to date has been provided by Denali Commission to AVEC, and matching cash contributions from AVEC, as shown in the following table:

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DC Award/Project 1464 Pilot Station RPSU - Relocate Power Plant Funding and Outlays	Federal Portion of Award - Denali Commission	Match Portion of Award - AVEC (cash)	Total All Sources
Funding - Direct Costs portion	\$ 684,800	\$ 171,200	\$ 856,000
Total Funding (Budget)	\$ 684,800	\$ 171,200	\$ 856,000
Eligible Outlays - Direct Costs	\$ 682,854	\$ 170,714	\$ 853,568
Total Eligible Outlays	\$ 682,854	\$ 170,714	\$ 853,568
<i>Direct Costs: Funding in Excess of Outlays</i>	\$ 1,946	\$ 486	\$ 2,432

Note: this award was issued prior to the effective date of 2 CFR 200, and the Indirect Cost regulations promulgated therein do not apply; see also Denali Commission award 1463 AVEC Program Administration.

Total funding (\$856,000 after one earlier deobligation amendment) exceeded total outlays (\$853,568) by \$2,432; of this amount, \$1,946 is federal funds and is available for deobligation.

Conclusions – Planning, designing and constructing several major infrastructure facilities in one community over an approximately ten-year timeframe yielded substantial efficiencies in the use of heavy construction equipment, labor, freight, and design resources. The measurable success of all of these projects was (and will continue to be) greatly due in part to the cooperation and support of these projects by the City of Pilot Station, Pilot Station, Inc., and members of the community. The contractor performed satisfactorily and to contractual expectations. The completed project meets all current regulations and codes governing electrical generation facilities of this size. Relocating the power plant and upgrading it with limited but essential improvements, rather than fully replacing it with new facilities, accomplishes an important Denali Commission objective: life-extension of workable existing facilities. The project was executed within a reasonable time frame, and within budget, including below the amended (decreased) budget.

Bibliography:

CRW Engineering Group, LLC: *Bulk Fuel & Power Plant Upgrade Project, Conceptual Design Report, Pilot Station, Alaska*. Prepared for Alaska Village Electric Cooperative, December, 2015.

Golder Associates; *Geotechnical Findings and Recommendations, Proposed Power Plant and Bulk Fuel Facility, Pilot Station, Alaska*; July 16, 2015.

NANA Pacific, Inc.; *Pre-Conceptual Design, Pilot Station Bulk Fuel Tank Farm and Power System Upgrade*; March 26, 2007; Prepared for Alaska Village Electric Cooperative.